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ABSTRACT

The study examined the influence of the semantic variable of contrastive gender of the pronoun, and the phonological variable of contrastive stress of the pronoun, on four- to eight-year-old children's comprehension of syntactic structures containing the nonidentity pronominal reference. Four types of items were generated: those containing syntactic information, those containing syntactic and semantic information, those containing syntactic and phonological information, and those containing syntactic, semantic, and phonological information. Multivariate analyses of variance examining differences between item types indicated that the semantic variable enhanced comprehension, while the phonological variable did not. Children can efficiently use a semantic strategy to aid comprehension at age five. (Author)

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A Developmental Study of the Influence of Semantic and Phonological Variables on Linguistic Comprehension[1]

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Abstract

The study examined the influence of the semantic variable of contrastive gender of the pronoun, and the phonological variable of contrastive stress of the pronoun, on four to eight year old children's comprehension of syntactic structures containing the non-identity pronominal reference. Four types of items were generated: those containing syntactic information; syntactic and semantic information; syntactic and phonological information; and syntactic, semantic, and phonological information. Multivariate analyses of variance examining differences between item types indicated that the semantic variable enhanced comprehension, while the phonological variable did not. Children can efficiently use a semantic strategy to aid comprehension at age five.

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A Developmental Study of the Influence of
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It is not clear how the semantic, syntactic, and phonological aspects of linguistic structure interact in the acquisition of language. Children's early sentences reveal that the child possesses only a partial knowledge of a well-formed sentence. The child proceeds from minimal generalized semantic and syntactic knowledge, to minimal generalized phonological knowledge of intonation and stress, to output (Menyuk, 1969).

In a study to more directly understand the influence of semantic variables on the comprehension of syntactic structure, Slobin (1966) examined the reaction time and number of errors of six to twelve year old children in judging the truth or falsity of sentences as they related to pictured scenes. One syntactic variable was sentence type - active or passive voice; the semantic variable was reversibility of the sentence. Slobin reasoned that if knowledge of syntactic structure was the only basis on which children responded, then judgements of truth or falsity of the pictured situations with respect to the corresponding oral sentence would be less accurate and reaction time longer for comprehension of the passive sentences than comprehension of the active sentences, regardless of whether or not the sentences were reversible.

This was found to be true for the reversible sentences, i.e., active sentences such as "the boy kissed the girl" were easier than passive sentences such as "the girl was kissed by the boy", but did not hold for the nonreversible sentences, i.e., active sentences such as "the girl picked the flower" were not easier to comprehend than passive sentences such as "the girl was picked by the flower". The semantic constraint of nonreversibility simplified verifying passive sentences of that type.

Turner and Rommetveit (1967) found the same results with four to nine year old children's comprehension of reversible and nonreversible sentences. In a study with younger children (two to six years) acting out active and passive sentences, Bever, Mehler, and Valian (1967) found that the youngest children studied did not appear to use a semantic strategy to aid in comprehension, but relied solely on syntactic information. The subjects were able to effectively use a semantic strategy only as they became older. Interestingly, for a brief period of time after their initial use of a semantic strategy the children's performance was actually depressed by their apparent incorrect use of a semantic strategy.

It would seem, then, that two to three year old children rely on syntactic information when faced with a problem in comprehension, become aware of the use of a semantic strategy at about age three to four, but are inconsistent in their ability to effectively use such a strategy until about age four and a half. From age four and a half to age twelve children very effectively use a semantic strategy to aid in comprehension.

The present study extended previous investigations by examining the influence of a semantic constraint other than reversibility, namely, gender of pronominal referent, on children's comprehension of a syntactic structure other than sentence voice, namely, structures containing the

nonidentity pronominal referent. The study also examined the influence of a phonological variable, namely, stress, on children's comprehension of structures containing the nonidentity pronominal referent.

The syntactic structure of sentences containing a pronoun and a noun phrase dictates whether the pronoun refers to the noun phrase occurring in the sentence, an identity relationship, or to another noun phrase not occurring in the sentence, a nonidentity relationship. Consider the following sentences which contain both a pronoun and a noun phrase:

(1) John thinks that he knows everything.

(2) After he got the ball, John left.

(3) He knew that John was going to win the race.

In sentences of type (1) and (2) the pronoun is contained in the subordinate clause (i.e., "that he knows everything" and "after he got the ball") and may or may not precede the noun phrase "John". In sentences of type (1) and (2) where the pronoun is contained in the subordinate clause, the pronoun may refer to the noun phrase "John" or to someone other than "John". Sentences of this type permit the pronoun either an identity or nonidentity relationship with the noun phrase occurring in the sentence. The syntactic structure of sentences of type (3), however, permit pronominal reference only to someone outside the noun phrase occurring in the sentence. Sentence (3) can only be interpreted as meaning "(someone other than John, for example) David knew that John was going to win the race". When a pronoun precedes the noun phrase in a sentence, and is contained only in the main clause, it is restricted to nonidentity.

Sentences containing the nonidentity pronominal reference allow both semantic and phonological variables to be manipulated independently

of syntactic structure. Consider the sentence, "She thinks that John knows everything", in which syntactic structure limits pronominal reference to nonidentity, However, the pronoun "she" provides a semantic constraint on the pronoun's referent, also restricting interpretation to pronominal nonidentity. In this sentence both syntactic and semantic information are provided as to the nonidentity of the pronominal referent.

The presence of phonological stress also affects comprehension of pronominal references (Maratsos, 1973). It was predicted that stress of the pronoun would signal a change in the situation and add emphasis to the pronominal referent, making the nonidentity reference easier to comprehend than if stress were omitted.

Method

Subjects. Subjects were 139 middle-class native English-speaking children from ages four to eight. The subjects were divided into eight age groups with a six month age range within each group. At least 16 subjects, eight male and eight female, were included in each of the age groups.

Experimenters. Two experimenters collected the interview data to allow for an examination of experimenter bias. Experimenter I was the principal investigator; Experimenter II was an undergraduate who was not at all familiar with the intent of the study. The assignment of experimenters for data collection was by school, grade, teacher, and sex of subject.

Instrumentation. Six items each of four item types comprised the test instrument. Item type I contained only syntactic information as to the nonidentity of the pronominal referent, e.g., "She knows that the girl is happy. Who knows?"; item type II contained syntactic and

semantic information as to the nonidentity of the pronominal referent, e.g., "He said that the girl is smart. Who said?"; item type III contained syntactic and phonological information as to the nonidentity of the pronominal referent, e.g., "She (stressed) knew that Raggady Ann was sick. Who knew?"; and item type IV contained syntactic, semantic, and phonological information as to the nonidentity of the pronominal referent, e.g., "He (stressed) was sure that the girl could dance. Who was sure?" Within each of the item types, half of the pronouns were male gender and half were female gender. See Appendix A for a list of the 24 stimulus items.

Procedure. Subjects were seen individually by one of two experimenters and asked for nonverbal pointing responses to the tape-recorded stimulus items. Each subject received all four item types according to the same randomized schedule of presentation. Four dolls, a Raggady Ann, a Raggady Andy, a boy, and a girl, were placed on a table before the child. A stimulus item, for example, "He was at school when Raggady Andy came to see him. Who was at school?" was given to the subject. The child responded to the item by pointing to one of the four dolls.

Results

Subjects' responses were coded and raw scores adjusted to correct for guessing.

A simple nonparametric procedure was used to examine experimenter bias. No systematic experimenter effect was found with subjects of either sex or in any age group.

Table 1 shows the overall (i.e., combining age groups and sexes) means and standard deviations for each of the four item types.

Insert Table 1 about here

A multivariate general linear model to carry out unbalanced multivariate analysis of variance was used to make the comparisons between item types. This analysis did take into account the correlation in means that would be expected due to the same subjects' responding to all four item types. The resultant F-ratios of the six possible overall item type comparions and their corresponding p values are shown in Table 2.

Insert Table 2 about here

Statistically significant differences in mean scores were found between items of type I and II; items of type I and IV; items of type II and III; and items of type III and IV. No statistically significant differences in mean scores were found between items of type I and III, and items of type II and IV. The analysis of overall differences of item types indicated that the semantic constraint of contrastive gender of the pronoun enhanced comprehension, while the phonological variable of contrastive stress of the pronoun had only a negligible influence on children's comprehension.

The analysis examining main effects of sex for each of the item types indicated that the comprehension of females was consistently superior to the comprehension of males. The means scores and standard deviations of males and females on the four item types are shown in Table 3.

Insert Table 3 about here

Table 4 shows the F-ratios and corresponding p values for main effects of sex on comprehension of each item type.

Insert Table 4 about here

Main affects of sex were found for item types I, II, and IV; the direction of the difference between means for item type III favored the female subjects.

The analysis examining the effect of age on children's comprehension of each of the item types revealed a basic linear trend in the data, as was expected. The combined mean scores and standard deviations of males and females on all item types by age group are shown in Table 5.

Insert Table 5 about here

Table 6 shows the F-ratios and corresponding p values for main effects of age on comprehension of each item type.

Insert Table 6 about here

Main effect of age were found for all four item types. Since the responses of both males and females to item types I and III, and item types II and IV, were not significantly different, the mean scores for these two sets of similar item types were combined to graphically

examine the effects of age on comprehension. Figure 1 shows the mean score of both sexes on item types I and III and item types II and IV by age group.

Insert Figure 1 about here

While there are slight pertabations in the curves, as expected as a function of sample size, the graph shows a basic linear developmental trend for both combinations of item types.

The only systematic deviation from the general developmental trend of the data occurs at age groups 2 and 3 for item types II and IV, both of which contain a semantic variable. This pattern of a systematic decrease in comprehension followed by a systematic increase in comprehension was found for both males and females for both types of items.

The analysis of effects of sex and age on comprehension revealed that no interactions were present for any of the four item types. That is, age and sex do not have an effect in combination which is different from the sum of their separate effects.

Discussion

The finding that girls are superior to boys in comprehension of the item types is consistent with previous research which has indicated the general superiority of girls on measures of verbal ability, the higher interest of girls than boys in school-related skills, and the greater compliance girls show to the requests of adults (Maccoby and Jacklin, 1974).

The introduction of phonological stress of the pronoun did not significantly affect comprehension. Past research had indicated that contrastive stress does alter the interpretation of sentences containing

the identity pronominal referent, yet it appears that stress does not signal a change in interpretation with structures containing the non-identity pronominal referent.

Past research has consistently indicated that five to twelve year old children are able to use a semantic strategy to aid in comprehension, while younger children have difficulty using a semantic stategy. For a short time in development it appears that comprehension is actually depressed by children's awareness of, yet incorrect use of, a semantic strategy. The present study supports these findings, suggesting that at about age four and a half (age group 2) children are just becoming aware of using a semantic strategy, and this awareness interfers with comprehension, depressing performance. At age five (age group 3) children become more efficient in using a semantic strategy to aid in comprehension, and their use of such a strategy becomes increasingly more efficient with age. This pattern of decreased and then increased comprehension when a semantic constraint is present is identical to that found by Bever, Mehler, and Valian, with the exception that the latter investigators reported the pattern occurring at a slightly younger age. The slight age shift is expected given that the present study examined a more complex syntactic structure which is typically acquired when children are older.

The task of the developmental psychologist is to engage in research that has potential for both advancing basic knowledge and has practical significance for contributing to education. While the thrust of this study's findings are directed toward supporting and making more generalizable the research on the interaction and influence of the syntactic and semantic aspects of linguistic structure, educational implications are also apparent. A description of the child's capabilities due to his

particular developmental stage provides essential information about the extent to which these capabilities mesh with curriculum materials and teacher linguistic behavior. A review of first and second grade readers of the Ginn Basics Reader 100 Edition revealed that many of the sentence structures containing pronouns were of a type too difficult for children of that age to comprehend. This study specifically suggests a closer examination of curriculum materials, especially those in reading, to ensure that the materials do, in fact, match with the linguistic development of the children to whom they are directed.

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Table 1

Mean Scores and Standard Deviations

for Each Item Type

Item Type	Mean	Standard Deviation
I	1.56	2.78
II	3.89	2.38
III	1.81	2.05
IV	4.13	2.06

Table 2

Overall Differences Between Item Types

Comparisons	df	F	p
I, II	1, 123	127.28	< .01
I, III	1, 123	5.00	n. s.
I, IV	1, 123	196.19	< .01
II, III	1, 123	84.55	< .01
II, IV	1, 123	5.27	n. s.
III, IV	1, 123	161.09	< .01

Table 3

Mean Scores and Standard Deviations

of Males and Females for Each of the Item Types

Item Type	Sex	Mean	Standard Deviation
I	M	1.05	2.08
I	F	2.07	2.17
II	M	3.28	2.69
II	F	4.27	1.74
III	M	1.43	2.18
III	F	2.19	1.85
IV	M	3.44	2.35
IV	F	4.82	1.35

Table 4

Main Effects of Sex for Item Types

Item Type	df	F	p
I	1, 123	10.84	< .01
II	1, 123	7.11	< .01
III	1, 123	5.34	n. s.
IV	1, 123	20.48	< .01

Table 5

Mean Scores and Standard Deviations

of Both Males and Females on all Item Types by Age Groups

Age Group	N	Item Type I		II		III		IV	
		$\bar{X}$	s.d.	$\bar{X}$	s.d.	$\bar{X}$	s.d	$\bar{X}$	s.d.
1	16	- .09	1.04	2.91	2.08	.92	1.59	3.09	2.00
2	16	.45	1.12	2.06	2.49	.77	1.46	2.72	1.91
3	17	.65	2.00	3.88	2.43	1.09	1.92	4.37	2.15
4	19	1.18	1.92	3.60	2.15	1.29	2.15	4.10	2.24
5	18	1.90	2.87	3.58	2.43	2.11	2.14	3.66	2.43
6	16	2.87	1.58	4.03	2.43	2.72	1.87	4.12	2.01
7	20	2.30	1.96	5.28	1.68	2.87	1.97	5.13	1.32
8	17	3.22	2.98	4.87	1.35	2.75	2.42	5.66	.84

Table 6

Main Effects of Age for Item Types

Item Type	df	F	p
I	7, 123	7.30	< .01
II	7, 123	3.78	< .01
III	7, 123	3.63	< .01
IV	7, 123	5.35	< .01

Figure 1

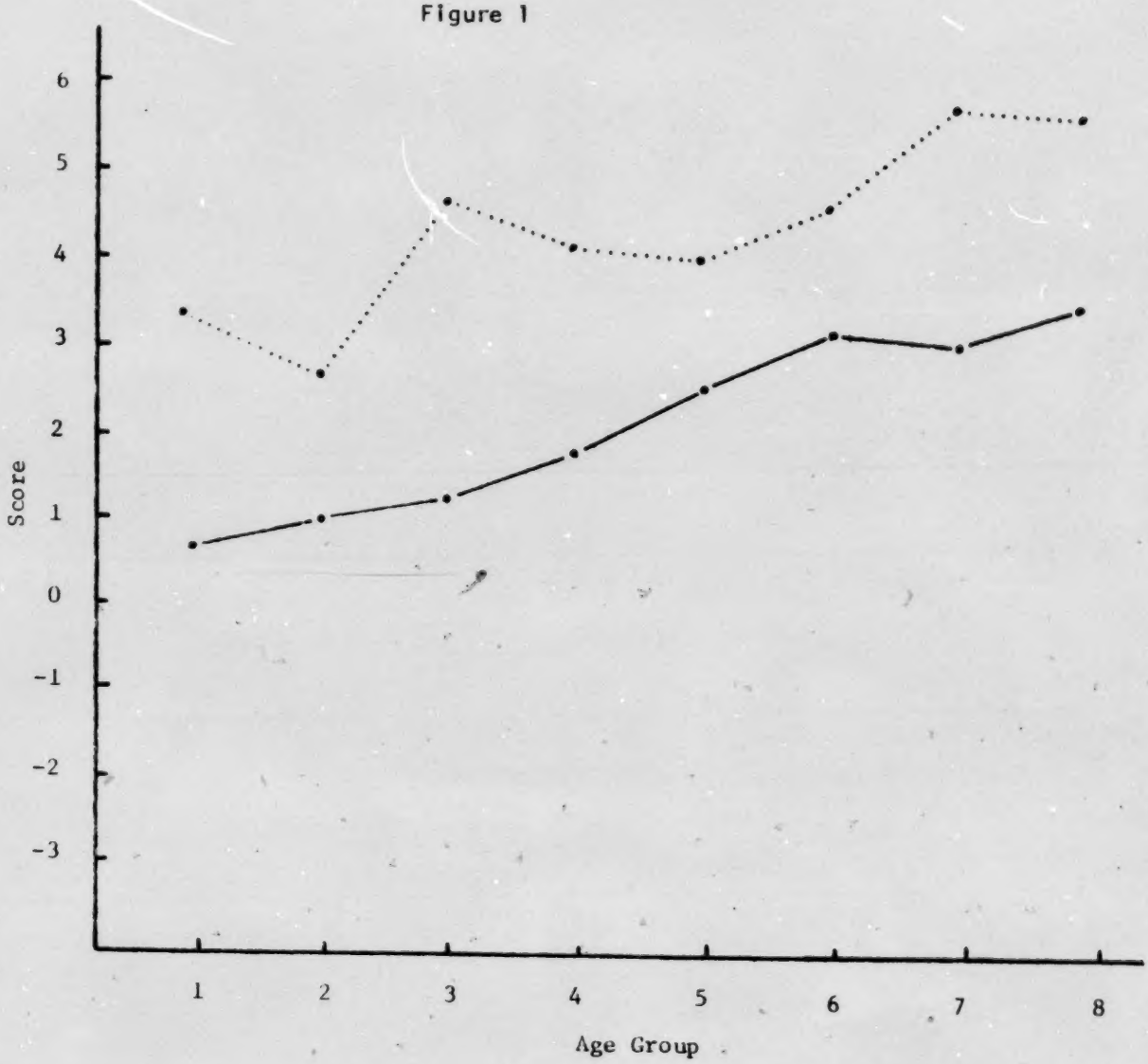

Figure Mean Scores of Both Males and Females for Item Types I and III and Item Types II and IV.

Item Types I and III: ————

Item Types II and IV: ·····

Appendix A

Item Type I
Syntactic

1. He was happy that the boy got the toy. Who was happy?
2. He was at school when Raggady Andy came to see him. Who was at school?
3. He is sure that Raggady Andy has the book. Who is sure?
4. She knows that the girl wants to play. Who knows?
5. She didn't know why Raggady Ann threw the candy away. Who didn't know?
6. She yawned when Raggady Ann started talking again. Who yawned?

Item Type II
Syntactic and Semantic

1. He went outside when Raggady Ann came in. Who went outside?
2. He knew that the girl was going to be late. Who knew?
3. He said that the girl feels sad. Who said?
4. She was six years old when Raggady Andy moved nextdoor. Who was six years old?
5. She thinks that the boy wants to go home. Who thinks?
6. She found out that the boy won the prize. Who found out?

Item Type III
Syntactic and Phonological

1. He (stressed) is sure that the boy has the ball. Who is sure?
2. He (stressed) said that Raggady Andy was hungry for lunch. Who said?
3. He (stressed) was sad that Raggady Andy was sick. Who was sad?
4. She (stressed) thinks that the girl knows everything. Who thinks?
5. She (stressed) yawned when Raggady Ann sat down. Who yawned?
6. She (stressed) knew that Raggady Ann would be at school today. Who knew?

Item Type IV
Syntactic, Semantic, and Phonological

1. He (stressed) said that Raggady Ann wanted the ball. Who said?
2. He (stressed) was sure that the girl would like the present. Who was sure?
3. He (stressed) was glad that the girl knew how to play the game. Who was glad?
4. She (stressed) jumped up when Raggady Andy came inside. Who jumped up?
5. She (stressed) was glad that the boy went to the party. Who was glad?
6. She (stressed) danced when the boy put on the record. Who danced?